CRITICAL IMPORTANCE OF NATURAL ANTIOXIDANTS IN CELL MEDIATED IMMUNITY

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Many products used by consumers on a daily basis are toxic or have toxic side effects. Most of these are chemicals of industry. These side effects are also referred to as "multiple chemical sensitivity" (MCS). There are calls for recognition of MCS as a true organic, biological illness as the evidence mounts. Interestingly and it is noteworthy that The Centers for Disease Control (CDC) recently recognized chemical sensitivity as a symptom of Chronic Fatigue Syndrome (CFS) (Chronic Fatigue Syndrome, Symptoms, 2006, Accessed January 2, 2007, from Centers for Disease Control Web site: http://www.cdc.gov/cfs/cfssymptomsHCP.htm).

In 1989, consensus criteria were established for the diagnoses and definition of MCS and later revised in 1999. The case criteria, currently under revision, define MCS for diagnostic purposes as meeting six criteria (Nethercott et al, Multiple Chemical Sensitivities Syndrome: Toward a Working Case Definition, Arch Environ Health, 1993;48:19-26):

1. The condition is chronic.
2. Symptoms recur reproducibly with repeated chemical exposure.
3. Symptoms recur in response to lower levels of chemicals than previously tolerated.
4. Symptoms appear in response to multiple chemically unrelated substances.
5. Symptoms improve or resolve when chemical irritants are removed.
6. Multiple organ systems are affected.

(cf:Position Statement - Multiple Chemical Sensitivity)

This is a broad criterion into which we could fit AIDS caused by or associated with oxidative stress and conditions induced by oxidative stress.

Fragrances have been shown to cause sensory irritation, pulmonary irritation, decreases in expiratory airflow velocity, and alterations of the functional observational battery in mice, indicative of neurotoxicity after an hour of normal level exposure to common cologne. The severity of the symptoms increased after mice were repeatedly exposed to the fragranced product. Subsequent analysis of the test atmosphere revealed the presence of chemicals with known irritant and neurotoxic properties, providing a toxicological basis to explain human complaints of adverse reactions to fragrances (Anderson & Anderson, 1998, Acute toxic effects of fragrance products, Archives of Environmental Health, 1998;53(2):138-46:Position Statement:cf, Multiple Chemical Sensitivity, http://www.petitiononline.com/MCSAPS/petition.html).

"The use of consumer cleaning agents and air freshener may yield high levels of volatile organic compounds (VOC's). Consumer cleaning products were shown to contain glycol

ethers, which are regulated toxic air contaminants, as well as terpenes, which can react with ozone to form a variety of secondary pollutants such as formaldehyde and ultrafine particles. Known chemical toxicants are emitted during air-freshener use, including d-limonene, dihydromyrcenol, linalool, linalyl acetate, beta-citronellol, alpha-pinene, beta-pinene, 3-carene, camphene, benzyl propionate, benzyl alcohol, bornyl acetate, isobornyl acetate, and benzaldehyde (cf:Position Statement: Multiple Chemical Sensitivity, http://www.petitiononline.com/MCSAPS/petition.html). Benzene and its derivatives are notoriously toxic to the mammalian biological system as they are capable of generating large amounts of free radicals that can lead to the formation of secondary radicals and the highly reactive peroxynitrite that in excess will lead to disease conditions arising from oxidative stress (see:AIDS, NON-HIV AIDS AND "PRESCRIPTION AIDS"). Many creams also contain 6-12 chemicals that may be in combination with 1-3 natural biomolecules.

"Numerous studies have documented toxic encephalopathy and other adverse reactions resulting from low level chronic exposure to various chemicals. Researchers have identified numerous physiological abnormalities in MCS subjects, including cardiac abnormalities, reactive upper airway disease, vasculitis, thrombophlebitis, impaired Phase 1 and Phase II detoxification clearance, glutathione depletion, tinnitus2, thyroid and adrenal abnormalities, gastrointestinal disturbances, T-cell activation/impaired NK cell function/auto-immune disorders, vitamin and mineral deficiencies, neurocognitive decline, rhinitis, sinusitis, respiratory inflammation, abnormal methacholine challenge, somatosensory abnormality, peripheral neuropathy, sleep disturbance, impaired balance16, and elevated levels of xenobiotics among others (ref:Position Statement: Multiple Chemical Sensitivity, http://www.petitiononline.com/MCSAPS/petition.html).

Human complaints of adverse reactions to drugs and other chemicals are related to or caused by excess free radicals by synthetic chemicals or D-form chemicals and the inability of the natural antioxidant system to cope with it. While the above conditions are produced by oxidative stress, it is critical to note the depletion of vitamins, minerals and glutathione which means there is a decline and impairment of the natural antioxidant defense mechanism against oxidative stress that is associated with the problems in the immune system as well. In other words, people today are more exposed to oxidative stress from the use of D-form chemicals including the widespread use of drugs to treat disease conditions.

The pertinent and key information in the above paragraph is of such critical importance that it must be stated in point form as follows:-

1. Vitamin and mineral deficiencies.

2. Glutathione depletion.

3. Impaired NK cell function/auto-immune disorders.

4. Thyroid and adrenal abnormalities.

5. Impaired T-cell activation.

Furthermore, it is pertinent to take note of "brain inflammation, biochemistry, oxidative stress, excitotoxicity and other interrelated mechanisms are correlated with symptoms of MCS (Pall M, 2003, Elevated nitric oxide/peroxynitrite theory of multiple chemical sensitivity: central role of N-methyl-D-aspartate receptors in the sensitivity mechanism. Environmental Health Perspectives, 111:12,1461-1464:Pall Martin L,2007, Explaining 'Unexplained Illnesses': Disease Paradigm for Chronic Fatigue Syndrome, Multiple Chemical Sensitivity, Fibromyalgia, Post-Traumatic Stress Disorder, and Gulf War Syndrome. Bighampton, NY: The Hawthorne Press). Excess peroxynitrite, implicated in MCS and related illnesses, depletes energy stores, which in turn causes extreme fatigue (Pall M, 2003, Elevated nitric oxide/peroxynitrite theory of multiple chemical sensitivity: central role of N-methyl-D-aspartate receptors in the sensitivity mechanism, Environmental Health Perspectives, 111:12,1461-1464).

Melatonin is a hormone produced by the pineal gland (a small gland inside the brain) that is most widely known for its regulatory role in the sleep-wake cycle. Its is also a powerful antioxidant that works synergistically with natural vitamin C. Sleep disorders may indicate oxidative stress problems in the pineal gland and a decline in melatonin production. Melatonin is a powerful hydroxyl radical scavenger, and is more than twice as effective as vitamin E at scavenging peroxyl radicals (Inserra et al, 1998, "Modulation of cytokine production by dehydroepiandrosterone (DHEA) plus melatonin (MLT) supplementation of old mice" Proc Soc Exp Biol Med 218: 76-82). In cancer patients with metastatic solid tumors, MLT administration increased the T4:T8 cell ratio (Caroleo et al, 1992, "Melatonin as immunomodulator in immunodeficient mice" Immunopharmacol 23: 81-89) while in another with human T helper cells, Garcia-Maurino and co-workers showed that "...melatonin is able to activate human Th1 lymphocytes by increasing the production of IL2 and IFN-G [interferon] in vitro. The results suggest that melatonin may be involved in the regulation of human immune function by modulating the activity of Th1 cells and monocytes ..." (Garcia-Maurino, et al, 1997, "Melatonin enhances IL-2, IL-6, and IFN-G production by human circulating CD4+ cells" J Immunol 159: 574-81). A decline in melatonin production will certainly lead to immunodeficiency in the presence of other factors such as depletion of glutathione and natural vitamin C as the white blood cells and cells of lungs are rich in vitamin C and require it for optimal cell function. L-ascorbic acid or natural vitamin C is an "immunostimulatory, anti-inflammatory, anti-allergic" vitamin and it is essential to promote optimal migration of neutrophils and macrophages to infection sites. High serum levels of natural vitamin C increase neutrophil mobility and lymphocyte transformation (Anderson R, "The immunostimulatory, anti-inflammatory and anti-allergic properties of ascorbate" in Advances in Nutritional Research, H. Draper, ed. NYC: Plenum Press, 1984, p. 19-45: Vojdani and Ghoneum, 1993, "In vivo effect of ascorbic acid on enhancement of human natural killer cell activity" Nutr Res 13 : 753-64). High levels of serum natural vitamin C may possibly block the pathways leading to the formation of immunosuppressive cytokines found in AIDS and TB patients.

Depletion in minerals such as zinc, copper, iron and manganese not only impairs the catalytic efficiency afforded to the glutathione-catalase enzyme system but also impair the integrity of the thymus for cell mediated immunity. Zinc is essential for the integrity of the thymus gland and for cell-mediated immunity. The thymus incorporates zinc into the inactive form of thymulin, a thymic hormone, creating active thymulin (ZnFTS) (Saha et al, 1995, "Zinc induces thymulin secretion from human thymic epithelial cells in vitro and augments splenocyte and thymocyte responses in vivo" Int J Immunopharmac 17: 729-33.) ZnFTS is necessary for the maturation and differentiation of stem cells into mature T cells (Mocchegiani et al, 1995, "Reversibility of the thymic involution and of age-related peripheral immune dysfunctions by zinc supplementation in old mice" Int J Immunophermac 17: 703-18). So, zinc from bioavailable sources improves T-cell activation and enhances natural killer (NK) cell activity. Natural killer cells are specialized cells that kill both cancer cells and cells that are harboring viruses. Their numbers increase with exercise, and supplementation with DHEA, thymus extract, vitamin E, selenium, beta-carotene, glutamine, and arabinogalactan. Their numbers fall with malnutrition, stress, alcoholism, inadequate sleep, and in people with chronic fatigue syndrome and other illnesses, drug abuse and in heavy smokers due to oxidative stress.

A decline or impairment in the adrenal gland can lead to lower output of cortisone which is anti-inflammatory. And when you add inflammations in soft tissue in the body produced by oxidative stress, with or without inflammatory cytokines, together with extreme fatigue to the above five key points, you get a pointer to a picture of AIDS.

Excess nitric oxide levels, as found in MCS patients, slows down the body's natural detoxification processes leaving chemical toxicants in the body for a longer period of time. Excess peroxynitrite is implicated in MCS and related illnesses, depletes energy stores, which in turn causes extreme fatigue. Peroxynitrite also increases the permeability of the blood brain barrier; excess levels allow chemicals greater chemical access to the brain (Pall M, 2003, Elevated nitric oxide/peroxynitrite theory of multiple chemical sensitivity: central role of N-methyl-D-aspartate receptors in the sensitivity mechanism, Environmental Health Perspectives, 111:12,1461-1464: Pall M, 2006, Multiple Chemical Sensitivity: The End of Controversy. Washington State University School of Molecular Biosciences, Accessed May 18, from: http://molecular.biosciences.wsu.edu/faculty/pall/pall_mcs.htm).

Peroxynitrite is represented by the formula $ONOO^-$. It is negatively charged because there are more electrons associated with them then there are protons in their nuclei. The superoxide anion or oxygen free radical reacts in nanoseconds with nitric oxide. This extremely rapid reaction is due to the fact that nitric oxide is also a free radical and the highly reactive species form the peroxynitrite as follows:-

$$O2^- + NO \text{ -----> } ONO2^-$$

The resultant paring of these two free radicals results in forming the peroxynitrite. It is not a radical but it is a highly reactive oxidant that can cause oxidative damage to cell

membranes and a wide variety of molecules in the body including DNA and proteins and hormones.

Metabolism of antibiotics in bacteria increases the amount of hydrogen peroxide and it accumulates in the bacterial cell leading to its death. Similarly, metabolism of D-form chemicals yields relatively much higher amounts of hydrogen peroxide in cells in the human body and offers greater opportunity for the formation of hydroxyl radicals and the perhydroxyl radical.

An integrative mathematical model was developed to obtain an overall picture of lipid hydroperoxide metabolism in the mitochondrial inner membrane and surrounding matrix environment. The perhydroxyl radical is the main initiation agent of lipid peroxidation and vitamin E can efficiently inhibit lipid peroxidation. Perhaps alpha-lipoic acid also similarly inhibits such lipid peroxidation. HO2- abstracts only bisallylic H atoms of fatty acids and it has been shown that HO2- is responsible for the vast majority of initiation of lipid peroxidation reactions in the inner membrane (Antunes et al., 1996, Lipid peroxidation in mitochondrial inner membranes, An integrative kinetic model, Free Radic Biol, Med. 21, 917-943; Kowald, 1999, The mitochondrial theory of aging: Do damaged mitochondria accumulate by delayed degradation? Exp. Gerontol. 34 605-612). This HO2- may be formed within the inner membrane itself (HO2- : The Forgotten Radical, Aubrey DNJ de Grey, Review Article, DNA and Cell Biology, Volume 21, Number 4, 2002 © Mary Ann Liebert Inc. p. 251–257) and this inference is of immense importance in designing antioxidant therapies because it allows the possibility of initiation of lipid peroxidation before any endogenous antioxidant enzymes, even including a putative intermembrane space SOD, have had access to the originating free radical and points to the special importance of natural exogenous fat soluble enzymes such as natural vitamin E or tocopherols and underscores the importance of identifying pathways that can scavenge it in membranes. Extracts obtained in the nano form from fruits, edible flowers and certain vegetables could perhaps cause dissociation of the H+ in the perhydroxyl radical and convert the superoxide anion into oxygen. This radical is holds one of the keys to anti-aging as it could lead to mitochondrial dysfunction or mitochondrial decay and disease conditions associated with such dysfunction, including chronic fatigue.

Depletion of mDNA is a serious problem in health and a factor in the initiation of disease conditions. Again the perhydroxyl radical is the culprit in the event of poor free radical scavenging activity and its conversion into neutral molecules such as oxygen. There are studies that demonstrate the ability of the hydrodioxyl (perhydroxyl) radical [HOO] to cause oxidative damage to DNA. In another study, experiments demonstrated support for 5'-hydrogen atom abstraction from the deoxyribose ring in the DNA which may provide a biomarker for the reactivity of HOO in vivo (Thomas et al, 1995, Mechanism of Site-Selective DNA Nicking by the Hydrodioxyl (Perhydroxyl) Radical, Biochemistry, 35 (14), 4578 -4583, 1996, 10.1021/bi952010w).

The issue of oxidative stress in AIDS is under denial by the proponents of HIV-causes-AIDS although Dr. Gallo said in his testimony in an Australian Court of Appeal that only 40% of AIDS patients have the virus. We are still looking for a vaccine but chances are it

will never be found (see: Are AIDS, CFS Caused By Oxidative Damage? and AIDS Diagnosis Based on Pseudo Science?). Now New Scientist reports that "the search for an AIDS vaccine has been dealt a heavy blow by the discovery that a group of Kenyan prostitutes thought to be immune to HIV have now caught the virus (Paris, Jan 26,AFP: also see BBC News, Health, World Edition).

The report is based on six women who were part of a group of 43 Kenyan prostitutes who had astonished AIDS researchers by remaining HIV-free for more than 15 years, despite intensive exposure to a range of virus strains who all have large numbers of special white blood cells, called cytotoxic T lymphocytes, that are primed to destroy other cells in which HIV lurks.

According to the report, the Oxford University specialists have sought to mimic the response by devising a vaccine containing fragments of the HIV virus tucked inside a disabled cowpox virus. Why resort to virus fragments or virus particles when there is a claim and purported proof of the virus called HIV?

Apparently early tests had shown the vaccine to be highly promising. The "vaccine" triggered a big response of the white blood cells when administered to monkeys and protected the animals against HIV infection. So, the effort in this case is about cell mediated immunity.

Gallo's supernatant contains "viral-specific proteins" and it is these proteins that are tested to see if they are present above certain concentrations to determine the HIV positive status of an individual. Activating T-cells against these proteins may hardly be the answer because they are not viral specific as claimed but found in a host of non-HIV conditions.

These large number of T-cells are activated T-cells that could be targeting an antigen. An antigen is any substance that elicits an immune response, including a virus and parts of broken protein molecules. Non-living substances such as toxins, chemicals and drugs can be antigens. The tests for HIV can be sero-positive for an antibody to a broken protein that is found floating as macrophage debris, not yet filtered off in the spleen. Such protein particles may be more commonly found in people recovering from another viral attack such as flu or cold and in people recovering from parasitic infections such as malaria. Other conditions common in underprivileged and impoverished communities that are known to cause false positive results are tuberculosis, hepatitis, and leprosy. False-positive ELISA [antibody] test results can be caused by alloantibodies resulting from transfusions, transplantation, or pregnancy, autoimmune disorders, malignancies and alcoholic liver disease.

Safety trials began this year on 30 British volunteers and trials were planned in Nairobi if all went well. The next step would be a trial in Kenya within five years, involving hundreds of people. The British scientific weekly says the vaccine designers may have to go back to the drawing board because the Oxford researcher Sarah Rowland-Jones has

discovered that six of the prostitutes, who have now left the business, had become HIV - positive.

The paradoxical conclusion - their immunity apparently fell away once they were no longer being exposed to HIV on a daily basis, she said, explaining: "This implies that to maintain immunity you need to have continual exposure." In this case, it is said that immunity is maintained by continual exposure!

Earlier we were led to believe that continual exposure leads to death by AIDS. So, now all the prostitutes are actually safer than the person with a one off exposure! If so, why administer toxic AZT to prostitutes or for that matter to "HIV-positive children? Dr Gallo claims that he is growing the HIV in an immortal line of T-cells which means they need only to provide more of that stuff for immunity!

First of all, viral-vaccine immunity is about antibody production for that virus and when the body develops immunity it does not go away, much less when you switch you profession. That immunity is not to be confused with the immune response involving the natural ability in healthy individuals who can activate enough T-4 cells and prime them against targets or as they say against "other cells in which HIV hides". Immune response from antibody production is different from cell mediated immunity. The former can be achieved through vaccines while activation and priming of white blood cells is part of a healthy biochemical process that is antioxidant-driven which occurs in the thymus gland. And it is dependent on nutrition which means high natural antioxidant intake as one way to address to some therapeutic extent the problem of antioxidant depletion in the human biological system during the course of metabolism.

However, the process of activation of T-cells in the thymus may be disrupted by mercury ions and benzene or benezene compounds that may have an affinity to the thymus (see:Copyright Dr. Hulda Clark, From the book "The Cure for HIV/AIDS"). Benzene has been implicated in cancers (Aksoy and Erdem, DinCol, 1974, G. Leukemia in shoe workers exposed chronically to benzene, Blood, 44; 837-841:Vigilani and Saita, 1964, Benzene and leukemia, NEJM., 872-876) along with some therapetic drugs (Rosner et al, 1979, Acute leukemia as a complication of cytotoxic chemotherapy, Int J Radiat Oncol Biol Phys., 5; 1705-1708). Benzene also causes increased incidence of mammary tumors and chromosomal damage in bone marrow cells. Benzene is toxic to the fetus and embryo. Benzene has immunotoxicity as it has adverse effects on the functioning of the immune system (Primer on Toxics). Some heavy metals can reduce the weight of the thymus.

Adverse effects of a chemical do not occur in a biological system unless that chemical reaches a target site in the body in sufficient concentration and for a long enough period of time to cause damage. The problems arise when chemicals accumulate in the thymus or if they continually enter any organ and its metabolism yields excess hydrogen peroxide or toxic metabolites that begin to deplete the body's natural antioxidants sufficiently to allow lipid peroxidation and oxidative damage to molecules or when the depletion is

sufficient to prevent reduction in the phenolic group of hormones that will block their stimulatory function.

Depletion of natural antioxidants in the body can have a retarding effect on the role of hormones with the phenolic group. The stimulatory activity of thyroxine and estradiol on peroxidatic reactions was lost on the blocking of the phenolic hydroxyl group of the hormones by the formation of the methyl ether, suggesting that the phenolic hormones acted as oxidation-reduction catalysts, first being oxidized by peroxidase and H2O2 to a form, probably the phenoxy radical, which was then reduced back to its original form by reaction with an electron donor, whose oxidation was thus accelerated. In the absence of an appropriate electron donor, the phenolic hormones were further oxidized and inactivated (Seymour J. Klebanoff, 2005, Myeloperoxidase: friend and foe, Journal of Leukocyte Biology, 2005;77:598-625). In fact natural vitamin C is an effective electron donor to melatonin and possibly all the hormones and helps to reduce it back to its original form – a process called antioxidant recycling which is important in health and antiaging.

Inactivation of hormones due to depletion of antioxidants in the body can disrupt healthy biochemical pathways and lead to disease conditions over time. X-ray crystallographic studies of human insulin crystals grown in the presence of tylenol have indentified a non-toxic phenolic derivative (Smith and Ciszak, 1994, The structure of a complex of hexameric insulin and 4'-hydroxyacetanilide, Proc Natl Acad Sci U S A. 1994 September 13; 91(19): 8851–8855) and zinc plays an important role in insulin hexamerisation, which is closely related to some of the processes in insulin biosynthesis and storage (Emdin et al, 1980, Diabetologia 19, 174-182). This evidence indicates the importance of high levels of natural antioxidants and bioavailable minerals to prevent diabetes and points to an approach in diabetic management keeping in mind that diabetics tend to have relatively higher populations of free radicals and the peroxynitrite or improve glucose metabolism after drug therapy. Inactivation of hormones is not the only problem associated with antioxidant depletion. Such depletion or low levels can lead to excess cytokine production.

"IL8 (an interleukin) can be an immunosuppressive cytokine, especially in people with AIDS or chronic lung infections (bacterial infections, pneumonia, tuberculosis. Glutathione is inversely correlated with IL8 in serum in both HIV-infected and non-infected persons and it (SeGSHPx) can inhibit IL8 release by endothelial cells. High levels of IL8 were found in tuberculosis patients who died in contrast to those who survived" (Baum, M.K. et al, 2000, "Selenium and interleukins in persons infected with human immunodeficiency virus type 1" J Infec. Dis., 182: s69-s73).

GSHPx/GSH are key antioxidant factors necessary to minimize the activation of NFKB, the nuclear factor that activates excessive production of oxidants and inflammatory cytokines, which are immunosuppressive at elevated levels (Grimble RF, 1997, "Effect of antioxidative vitamins on immune function with clinical applications" Int J Vit Nutr Res 67: 312-20). Oxidative stress tends to deplete glutathione levels and AIDS patients are generally low in glutathione. Low glutathione levels and "diminished selenium-status and

excessive NFKB activation is a major factor in moving HIV-infected people into full-blown AIDS" (Baum et al, 2000, "Selenium and interleukins in persons infected with human immunodeficiency virus type 1" J Infec Dis 182: s69-s73). It appears that high levels of natural antioxidants in the body prevents the activation of natural cytokines that can be immunosuppressive when they produce oxidative changes in the cell membranes of cells of the immune system.

An extremely meaningful study was carried out in the field of prevention of immune dysfunction. In their 1999 study, Zhang and colleagues infected female mice with a leukaemia retrovirus that induced mouse AIDS. They observed that the retrovirus infection reduced the release of TH1 cytokines but stimulated the release of TH2 cytokines which increased liver lipid peroxidation and caused a vitamin E deficiency. Natural vitamin E is also depleted by perhydroxyl radicals. Treatment with DHEA or melatonin (MLT), alone or in combination "largely prevented the reduction of B- and T-cell proliferation as well as of Th1 cytokine secretion caused by retrovirus infection. Supplementation also suppressed the elevated production of Th2 cytokines stimulated by retrovirus infection. DHEA and MLT simultaneously reduced lipid peroxidation in the liver and prevented vitamin E loss" (Zhang et al, 1999, Prevention of immune dysfunction and vitamin E loss by dehydroepiandrosterone and melatonin supplementation during retrovirus infection, Immunol 96: 291-97). Hence a radical change in nutrient intake especially a change to consuming a broad range of antioxidants from food or edible sources can alter the progress or course of disease conditions involving oxidative stress and immunosuppressive or inflammatory interleukins and high antioxidant intake improves cell mediated immunity.

Acetyl-L-Carnitine (ALCAR) is a popular nutrient for gerontologists interested in extending healthy life, primarily because it helps to regenerate age-related deficits in mitochondrial function (Shigenaga et al, 1994, "Oxidative damage and mitochondrial decay in ageing" Proc Natl Acad Sci USA 91: 10771-8) and there are studies that indicate that it improves activated cell-mediated immunity (Jirillo et al, 1991, "Effects of acetyl-l-carnitine oral administration on lymphocyte antibacterial activity ... in patients with active pulmonary tuberculosis" Immunopharmac Immunotoxic 13: 135-46).

A vastly improved antioxidant intake together with ALCAR can improve overall free radical scavenging activity in the body, improve cell function, improve cell mediated immunity and help drive the healthy biochemical pathways, prevent depletion of mDNA, prevent lipid peroxidation and prevent oxidative damage to cell membranes that helps to rejuvenate mitochondria which alleviates fatigue or chronic fatigue, a symptom of AIDS. Conversely, a sudden decline in nutrient intake and selenium status resulting in drastically lower levels of antioxidants required for robust immune function and cell mediated immunity can also alter the course of a disease condition especially one associated with oxidative stress.

So, what really happened with the six Kenyan HIV-prostitutes? We may never know the truth but a sound and logical conjecture is that when they "left their business" their income levels may have dwindled and so did their nutrient status, subsequently leading to

lower antioxidant levels and lower cell mediated immunity. Whatever happened, it is important to note that drugs do not and cannot induce cell mediated immunity. Excessive use of chemicals and drugs can deplete the body's antioxidants sufficiently to promote oxidative stress leading to disease conditions and the use of very toxic chemicals like AZT can lead to symptoms of AIDS. Excessive use of drugs can suppress cell mediated immunity or impair it altogether.